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Announcement of the

Summer School of Biology

1924

July 5—August 15

Ithaca, New York
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THE CALENDAR

SUMMER SESSION OF 1924

THE FIRST TEN DAYS

July 5, Saturday, 8 A. M.—5 P. M.	Registration, <i>Room A, Goldwin Smith Hall.</i>
July 7, Monday.....	Instruction begins at the time and place announced for each course. Registration is continued in <i>Room A, Goldwin Smith Hall.</i>
July 8, Tuesday evening.....	Organ Recital, <i>Sage Chapel.</i>
July 9, Wednesday evening.....	Departmental Lectures and Conferences.
July 10, Thursday evening.....	Piano Recital, Professor Otto Kinkeldey.
July 11, Friday, until 4 P. M.	Last day for payment of fees at the Treasurer's office, <i>1 Morrill Hall.</i>
July 13, Sunday, 11 A. M.	Public Worship and Sermon in <i>Sage Chapel.</i>
July 13, Sunday evening.....	Organ Recital, <i>Bailey Hall.</i>
July 14, Monday evening.....	Lecture Course, <i>Barnes Hall.</i>

THE REGULAR WEEKLY SCHEDULE

Sunday, 11 a. m.	Public Worship and Sermon, <i>Sage Chapel.</i> (Beginning July 13.)
Sunday evening,	Organ Recital, <i>Bailey Hall.</i> (Beginning July 13.)
Monday evening,	Lecture Course, <i>Barnes Hall.</i> (Beginning July 14.)
Tuesday evening,	Organ Recital, <i>Sage Chapel.</i> (Beginning July 8.)
Wednesday evening,	Departmental Lectures and Conferences. (Beginning July 9.)
Thursday evening,	Piano Recital, Professor Kinkeldey. (Beginning July 10.)

CONCERTS

July 18, Friday evening:	Concert. <i>Bailey Hall.</i> Artist to be announced.
August 1, Friday evening:	Concert. <i>Bailey Hall.</i> Artist to be announced.

THE LAST DAY

August 15, Friday.....	Summer Session ends.
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THE WEEKLY CALENDAR

The WEEKLY CALENDAR of the University carries announcements of all public exercises held in connection with the Summer Session. It is posted on the bulletin boards.

SUMMER SCHOOL OF BIOLOGY

Under the auspices of the Summer Session of Cornell University and of the Summer School of the New York State College of Agriculture.

Students attending the School of Biology must register both in the Summer Session and in the Summer School of Agriculture, paying, however, but one tuition fee.

STAFF OF INSTRUCTION

HOWARD BERNHARDT ADELMANN, A.M., Instructor in Histology and Embryology

JAMES CHESTER BRADLEY, Ph.D., Professor of Entomology (Taxonomy).

OTIS FREEMAN CURTIS, Ph.D., Professor of Botany (Physiology).

ARTHUR JOHNSON EAMES, Ph.D., Professor of Botany.

HARRY MORTON FITZPATRICK, Ph.D., Professor of Plant Pathology (Mycology).

ALLAN CAMERON FRASER, Ph.D., Assistant Professor of Plant Breeding.

WILLIAM ARTHUR HAGAN, D.V.M., Professor of Pathology and Bacteriology.

OSCAR AUGUSTUS JOHANNSEN, Ph.D., Professor of Entomology.

BENJAMIN FREEMAN KINGSBURY, Ph.D., M.D., Professor of Histology and Embryology.

LOUIS MELVILLE MASSEY, Ph.D., Professor of Plant Pathology.

ROBERT MATHESON, Ph.D., Professor of Entomology.

JAMES GEORGE NEEDHAM, Ph.D., Litt.D., Professor of Entomology and Limnology.

HUGH DANIEL REED, Ph.D., Professor of Zoology.

LESTER WAYLAND SHARP, Ph.D., Professor of Botany (Cytology).

SUTHERLAND SIMPSON, M.D., D.Sc., F.R.S.E., Professor of Physiology.

KARL MCKAY WIEGAND, Ph.D., Professor of Botany (Taxonomy).

CARL LOUIS WILSON, Ph.D., Instructor in Botany.

ALBERT HAZEN WRIGHT, Ph.D., Assistant Professor of Zoology.

BENJAMIN PERCY YOUNG, Ph.D., Assistant Professor of Zoology.

GENERAL PLANS AND AIMS

The Summer School of Biology was organized to provide instruction of the highest grade in zoology, botany, and allied subjects. All the regular facilities of the University are at the disposal of the student, and as far as possible the staff has been restricted to teachers of professorial rank in the University. The courses offered are for the most part those given during the regular academic year condensed into a period of six weeks, but not abridged. The work is particularly planned to meet the needs of teachers and graduate students who wish to know, in addition to the subject matter, something of the methods and sources in teaching; but undergraduates also, if sufficiently prepared, will find the courses adapted to their needs. Intensive rather than extensive work is necessarily expected of each student,

as the courses are comprehensive. These courses lead towards advanced degrees, and special attention is given to graduate students pursuing research. Students interested in graduate study should, if possible, consult by letter with Professor Wiegand, or the professor concerned, before coming to Ithaca.

ADVANTAGES OF LOCATION

The intensive interest in Biology at Cornell University over a period of years has resulted in a wealth of laboratory material. Very extensive and in some cases unique collections of both plants and animals, and a very complete working library, are available to students prepared to make use of them. Ithaca is located in the Finger Lakes region of Central New York, noted not only for its picturesque beauty, but for its richness in biological material of both plants and animals. In this respect the advantages of the University are perhaps not excelled by any other institution in the country. The collecting grounds are for the most part adjacent to the campus, and can be very readily reached. Within easy reach of the laboratories are freshwater marshes and lakes, salt springs, marl springs, marl bogs, peat bogs, extensive ravines with numerous waterfalls, and upland woods or fields overlying either calcareous or noncalcareous sandy or heavy soils. The country shows a considerable variation in elevation, thus giving samples of several life zones. It is therefore possible to use as illustrative material those inland organisms which may be obtained most readily by teachers throughout the country for use in their own classes.

GENERAL INFORMATION

ADMISSION

Correspondence with reference to the School of Biology should be addressed to Professor Karl M. Wiegand, Stone Hall, Cornell University, Ithaca, N. Y.

There are no examinations for admission to the School. Each person must, however, satisfy the instructor in charge of every course he intends to take, unless it be elementary, that he is qualified to pursue the work.

Admission to the classrooms during the Summer Session is restricted to students duly registered for the session. A student duly registered may visit any class.

REGISTRATION

All students of the School are required to register with the Registrar of the University. The hours and places of registration are given in the Calendar of the session, on page 2. Students may register on Saturday, July 5, between 8 a. m. and 5 p. m., or on the day of their arrival, if they reach Ithaca on July 7 or later. They are urged to register on July 5. Registration before that day is not required, and it is not necessary to apply in advance for registration blanks.

Beginning on Tuesday, July 8, the Registrar's office in Morrill Hall will be open from 9 a. m. till 4 p. m. every week day except Saturday, when it will be closed at noon.

Students who wish to obtain credit for graduate work to be done during the Summer Session must register not only with the Registrar but also with the Dean of the Graduate School, at his office in Room 22, Morrill Hall.

Persons who are to take courses in the Summer School of Biology and in any department of the Summer Session of the University must register for both the Summer School and the Summer Session. They are required to pay only one tuition fee.

TUITION

The charge for tuition in the Summer School of Biology is forty dollars.

The tuition fee is payable in full, on the first registration day or within the next five days, at the office of the Treasurer, Room 1, Morrill Hall.

Any student who fails to pay his tuition charges, other fees, and other indebtedness to the University, or who, if entitled to free tuition, fails to claim it at the Treasurer's office and to pay his fees and other indebtedness, within the prescribed period of grace, is thereby dropped from the University unless the Treas-

urer has granted him an extension of time to complete payment. The Treasurer is permitted to grant such an extension when, in his judgment, the circumstances of a particular case warrant his doing so. For any such extension the student is assessed a fee of \$5 for the first week and \$2 additional for each subsequent week in which the whole or any part of the debt remains unpaid, but the assessment in any case is not more than \$15. The assessment may be waived in any instance for reasons satisfactory to the Comptroller and the Registrar, when such reasons are set forth in a written statement.

If a student withdraws from the Summer Session, the Treasurer may refund a part of the tuition fee or cancel a part of the obligation that the student has incurred for tuition, provided the reason for the withdrawal be stated in writing and be satisfactory to the Comptroller and the Registrar. In such a case the student is required to pay twenty-five per cent of the term's tuition for each week or fraction of a week between the first registration day and the date of his certificate of withdrawal.

Students registering at any time during the last four weeks of the Summer Session or of either term of the summer session of the College of Law are required to pay for the remainder of the term at the rate of twenty-five per cent of the term's tuition for each week or fraction of a week between the date of registration and the last examination day of the term.

Any tuition fee or other fee may be changed by the Trustees to take effect at any time without previous notice.

LABORATORY FEES

A fee is charged, as stated under each course, to cover the use of materials and laboratory equipment. In some courses a deposit is required to cover breakage and apparatus checked out to students during the period of the session.

UNDERGRADUATE ACADEMIC CREDIT

On the completion of any course offered in the Summer School of Biology the student may receive credit toward a degree for the number of hours indicated under each course. Requirements for the baccalaureate degree in each college may be learned on application.

GRADUATE WORK

Graduate students, if not candidates for advanced degrees, may take any courses desired with no further formalities than those indicated above.

A graduate of any college whose requirements for a first degree are substantially equivalent to those for the first degree at Cornell may be admitted to resident study in the Graduate School. He may at once enter upon candidacy for an advanced degree if he is able to show that he has had adequate preliminary training in the subjects in which he proposes to work.

Students wishing to become candidates for an advanced degree and to study in the Summer Session are advised to write to the professor whose work they expect to take or confer with him personally before the opening of the session. They should also write to the Dean of the Graduate School, asking for a blank form of application for admission to the Graduate School. Delay may be avoided by making these arrangements before coming to Ithaca. In this way, moreover,

it may be possible to secure the advice and guidance of professors in fields of study of which no specific mention is made in the announcements.

Before beginning his work a graduate student must register with the Registrar and with the Dean of the Graduate School. The latest date for such registration in 1924 is July 10. Work leading toward the degrees of A.M., M.S., and Ph.D. is offered. The candidate wishing to matriculate for the Master's degree must select an acceptable major subject and one related minor subject and obtain the signatures of the professors representing those fields of study. The professors with whom he thus works constitute his special committee. If he is to be a candidate for the degree of Doctor of Philosophy he must choose at least one professor under whom he is to pursue his major work and at least two other professors each to represent one minor subject, and these men constitute his special committee. While the candidate is expected to assume the initiative and responsibility for his studies, he is expected to follow the general advice of this committee, who will examine him on the completion of his work, and recommend him for the degree. A thesis is required for each degree.

The residence requirement for the Master's degree is one academic year or its equivalent, and for the Doctor's degree three years. During this period the candidate is required to be present and engaged in his work at the University. The residence requirements for the Master's degree may be fulfilled in whole or in part by attendance during the Summer Session. For this purpose ~~two~~ Summer Sessions will be regarded as the equivalent of one year. No period of less than six weeks will be counted toward residence. Candidates for this degree who are in residence during the Summer Sessions only are also required to continue their studies during the year under the direction of the chairman of the special committee in charge of their work. Residence credit for the degree of Doctor of Philosophy during the summer is contingent upon the length of time and the nature of the work to be done, and *must be arranged for in advance*.

Students of the Summer School of Biology who have been admitted to candidacy for an advanced degree are required to pay the regular tuition of the session, but are exempt from tuition and administration fees in the Graduate School. On registering for the first time as candidates, students who have not previously matriculated in Cornell University will be given matriculation without payment of the usual fee on presenting a certificate that they have paid the tuition charges for the current Summer Session.

It should be noted that graduate work at Cornell is not expressed in terms of courses or hours. The requirements are based rather upon actual achievement in scholarship and research in the fields indicated by the major and minor subjects. The excellence of achievement is determined in part by a special examination before the candidate is recommended for a degree. Graduate work, to be considered acceptable for a degree, must be of an advanced character.

An invitation is issued to scholars who are beyond the stage of regular graduate study to make use of the resources of the University in the field of Biology for carrying on research.

CERTIFICATES FOR WORK DONE

Students of the Summer Session who are not matriculated in the University may receive certificates of attendance and of work satisfactorily performed. Application for them must be made before August 15, and the applicant must leave at the office of the Registrar a large-sized envelope stamped and directed to his home address. The certificate will then be forwarded by mail. The regulations of each department for the granting of a certificate must be met.

RESIDENTIAL HALLS: ROOMS: BOARD

FOR WOMEN

The University has three residential halls for women in which rooms and board may be obtained during the Summer Session by registered students only. They are:

Sage College, which accommodates 175 persons. Here the charge for room, table board, and a specified amount of laundry, for the session, is from \$72 to \$87, according to the size and location of the room.

Prudence Risley Hall, which accommodates 184 persons. Here the charge for room, table board, and a specified amount of laundry, for the session, is from \$78 to \$87, according to the size and location of the room.

Cascadilla Hall. In this building, which accommodates about 160 persons, a furnished room may be had for the session at a cost of \$23 to \$29. The charge includes a specified amount of laundry. This building has shower baths and not tubs. On the ground floor the University conducts a cafeteria restaurant where meals can be obtained at reasonable rates.

Besides these halls, there are certain *approved houses* which are occupied exclusively by women and which, like the halls, are under the direct supervision of the Dean of Women.

Undergraduate women students of Cornell and other colleges and other women students under twenty-one years of age are expected to live in the residential halls or the approved houses. It is not advisable for any woman student to engage a room in a place not recommended by the University.

In Sage College and Prudence Risley Hall, the charge for room and board includes lodging Friday night, July 4 (not earlier), breakfast Saturday, July 5, and all meals to and including breakfast Saturday, August 16.

Members of the Summer Session who lodge outside Sage College and Prudence Risley may obtain table board at either of those halls for \$9 a week.

Each of the residential halls is in charge of a warden, who is glad to know the students, to advise them in illness or other emergency, and to give them whatever information they wish about the University or the town. It is understood that persons living in the halls will conform to the house regulations made for the convenience and comfort of all.

Application for rooms in any of the residential halls or approved houses for women should be made to the Manager of Residential Halls, Sage College, Ithaca, N. Y. Information about such rooms may be obtained from the Manager in advance of the application. The list of approved houses will be available after June 1st on application to the Manager, and also, if desired, a supplementary list of private houses with desirable rooms available for mature women who prefer to live outside any of the halls or approved houses. Checks should be drawn to the order of Cornell University.

A deposit of five dollars must accompany each application for a room in any of the three residential halls; otherwise the application will not be entertained. The rooms are reserved in the order of application. If a room assigned is occupied by the applicant, the amount of the deposit is held until the end of the session to cover the return of keys and any damage to building or furniture other than ordinary wear and tear, and to insure the completion of the lease. The deposit will be refunded if the applicant gives formal notice to the Manager on or before June 15 that she wishes to withdraw her application.

FOR MEN

Men attending the Summer Session can obtain comfortable and attractive rooms in the new Residential Halls for Men, which are west of the main quadrangle, conveniently near to the other University buildings. Those halls are thoroughly modern and of fireproof construction.

Application for rooms in the Residential Halls for Men, or for plans of the rooms or other information about them, should be made to the University Comptroller, Morrill Hall, Ithaca, N. Y. Checks should be drawn to the order of Cornell University.

The charge for furnished room, including care of the room and laundry of bed linen, is \$21 for the session. There are a few suites at a higher rate, and some rooms on the top floor may be had for less.

Board may be obtained for an average of \$1 to \$1.50 a day in a dining room within a hundred yards of the residential halls, which is conducted by the University on the cafeteria plan, or in other dining rooms or restaurants on or near the campus.

A list of private houses offering desirable rooms for rent for the session can be obtained after June 1st by application to the Manager of Residential Halls, Sage College, Ithaca, N. Y.

THE COST OF LIVING

An estimate of the cost of living in Ithaca in the summer can be made by consulting the figures given above. In a private house a student may be able to rent a room at a little less cost for the session than in one of the residential halls. Rooms are rented with the understanding that they will be occupied for the entire session unless both parties agree otherwise. Table board is generally engaged by the week.

MEANS OF SELF SUPPORT

Students, either men or women, who wish to earn a part of their expenses during the session are invited to correspond in advance with the Manager of Residential Halls, Sage College, Ithaca.

THE STUDENT'S HEALTH

MEDICAL ADVICE

The University's staff includes a medical adviser of men and a medical adviser of women, and each of them has a corps of assistants. The medical advisers observe regular office hours, from 10 A. M. till 12 M. daily, at their respective offices in the Gymnasium for men and in Sage College for women. No charge is made for their services.

In cases of illness or indisposition which involve absence from classes even for one day, students are expected to report immediately either in person, by telephone, or by messenger to the medical adviser's office. For the convenience of the adviser such illness should be reported early in the day. Students indisposed but still able to attend classes should consult the medical adviser immediately in order that advice may be given and that diagnosis of incipient diseases may be made promptly. Any student failing to report as soon as possible to the medical adviser any contagious or infectious disease will be regarded as guilty of a serious breach of discipline.

A medical examination is not required of students in the Summer Session, but any student may have such an examination without charge by applying to the medical examiner.

A student may at any time be requested to withdraw from the University if, in the opinion of the University authorities, the condition of his health is such as to make it unwise for him to remain.

THE UNIVERSITY INFIRMARY

The University Infirmary occupies three large buildings near the campus. The first of these, a brownstone structure, was the home of Henry Williams Sage, for many years chairman of the Board of Trustees of the University. After his death in 1897, his sons, Dean and William Henry Sage, endowed it and gave it to the University for a students' infirmary as a memorial of their father. The second building, the Schuyler House, was purchased in 1911; in 1912 the

Trustees erected a third building, fireproof, and this is the present main hospital building. The normal capacity of the Infirmary is seventy-five beds; the number can be doubled in an emergency.

The Infirmary, which is in charge of an experienced superintendent and is thoroughly equipped, provides suitable rooms, food, and nursing for sick students. It has no medical staff; students find their own physicians among practitioners in Ithaca or elsewhere.

Students in the Summer Session have all the privileges of admission to the Infirmary. They pay no fee in advance, but are liable to regular charges for services rendered.

THE LIBRARIES

The University Library is open on week days from 8 A. M. till 10:30 P. M. In this building are the main library, containing about 500,000 volumes, and most of the seminary and special libraries. The main reading room affords accommodations for more than two hundred readers, and contains a selected library of about 8,000 volumes of reference works. Below stairs is the periodical room in which are kept the current numbers of about 500 journals in various fields of knowledge. These rooms are open to all students. Students properly qualified are allowed the use of the seminary rooms and the books in them. The main collection is primarily a library of reference for use in the building. Students are, however, to a limited extent, allowed to take out books for home use. Persons wishing this privilege must make a deposit of \$5, which will be refunded upon the return of all books taken out.

The library of the College of Law numbers more than 56,000 volumes and about 5,800 pamphlets, to which generous additions are made yearly. It includes the library of the late Nathaniel C. Moak of Albany, N. Y., which was presented in 1893 by Mrs. A. M. Boardman and Mrs. Ellen D. Williams, as a memorial to Judge Douglas Boardman, the first dean of the College. In reports of the federal courts, and of the several American State jurisdictions, and in English, Scotch, Irish, Canadian, Australian, and English colonial reports, the law library is practically complete to date.

The Library of the College of Agriculture, in the basement of Stone Hall, is open on week days from 9 A. M. till 5 P. M., except Saturday, when it is closed at 1 P. M. In it will be found a large collection of bulletins and reports of experiment stations, reference books on agriculture and country life, agricultural periodicals, and the like. The entomological library, in the department of entomology on the fourth floor of Roberts Hall, is one of the most complete of its kind in the United States. Nearly all of the departments in which instruction is given have well-selected departmental libraries.

SAGE CHAPEL

Religious services are conducted in Sage Chapel throughout the academic year by clergymen of various religious denominations. There will be services in the Chapel on five Sundays during the Summer Session, July 13 to August 10 inclusive.

LECTURES: MUSICAL RECITALS: EXCURSIONS

In addition to the regular classroom work there will be general public lectures on Monday evenings, and also lectures of general interest each week in connection with the work of various departments. They will all be announced in the Weekly Calendar.

Organ recitals will be given on Tuesday evenings in Sage Chapel and on Sunday evenings in Bailey Hall. A piano lecture-recital will be given each week.

Two concerts by distinguished artists will be given in the course of the session; see the Calendar on page 2. Students can buy tickets for these concerts at reduced rates.

Wednesday evenings are devoted to the departmental conferences, which are open to all interested persons. Notice of these conferences will be given from week to week.

Excursions, in connection with the work of certain departments, are made to many points of interest. Some of them are open to all members of the Summer Session. Especially noteworthy are the excursions to Watkins Glen and to Niagara Falls.

RAILROAD ROUTES TO ITHACA

Ithaca can be reached from New York City by either the Delaware, Lackawanna & Western or the Lehigh Valley Railroad. On both roads there are good trains, with Pullman cars, both night and day. Passengers from the west reach Ithaca by way of the Lehigh Valley Railroad from Buffalo. From stations on the Boston & Albany Railroad, the shortest route to Ithaca is by way of Syracuse and Auburn. From Philadelphia, and from Baltimore, Washington, and the south by way of the Baltimore & Ohio, the Philadelphia & Reading connects with the Lehigh Valley at Bethlehem. From stations on the Erie, connection with Ithaca can be made either by the Lackawanna at Owego or by the Lehigh Valley (Elmira and Cortland branch) at Elmira. Ithaca has connections with the New York Central at Geneva, Auburn, and Canastota.

COURSES OF INSTRUCTION

The word *hour* when used with reference to University credit means the equivalent of one lecture or recitation or two and one-half to three hours of laboratory work a week for a half-year or one semester. In order that this amount of credit may be obtained in six weeks the work done per week must be fully two and one-half times as great. One hundred and twenty such hours are required of candidates for the A.B. degree.

[A limited amount of change in the hours scheduled may be made by the staff at the beginning of the session to avoid conflicts. In the case of morning laboratories the student may obtain permission, at the option of the instructor, to be absent for a period to attend a lecture in some other course. The time so lost is to be made up later.]

COURSES DEALING PRIMARILY WITH PLANTS

S 1. GENERAL BOTANY. Credit six hours. Equivalent to Botany 1. Lectures, M T W Th F, 8. Laboratory, M T W Th F, 9-12, W, 2-4:30. Recitations or conferences, T Th, 2-5. *Stone*. Professor EAMES and Dr. WILSON.

This course is designed to furnish a general knowledge of the fundamental facts and principles of plant life. A careful study is made of form, structure, and reproduction of representatives from the principal groups, with a view to orient the student in the plant kingdom, and to acquaint him with the principal evolutionary tendencies exhibited. Considerable attention is given to life processes, particularly in the higher plants, and to information necessary in the prosecution of more advanced or practical work connected with plants and animals. Laboratory fee, \$5.00.

S 2. PLANT PHYSIOLOGY. Credit four hours. Equivalent to Botany 20. Prerequisite, course 1 or its equivalent, chemistry, and permission to register. Lectures, M T W Th F, 12. Laboratory, T W Th F, 9-12. *Stone*. Professor O. F. CURTIS.

This course is designed to acquaint the student with the general principles of plant growth. Topics such as water-relations, photo-synthesis, translocation, digestion, respiration, mineral nutrition, and reproduction are studied in some detail and particular emphasis is placed both in laboratory and classroom on discussions of the principles and their applications to growing plants. Laboratory fee, \$4.00; deposit, \$2.00.

S 3. TAXONOMY OF VASCULAR PLANTS. Credit four hours. Equivalent to Botany 6. Prerequisite Course 1 or its equivalent. Lectures, M T W Th, 11. Laboratory, M T W Th, 2-5. Several all-day field trips will be arranged. *Stone*. Professor WIEGAND.

A study of the kinds of seed plants and ferns; their classification into genera, families, and orders; and field work on the local flora. Emphasis will be placed on wild plants, but the more common cultivated plants will receive some attention. The course is planned to follow Course 1 and to furnish an introduction to the knowledge of field botany and to the classification of the higher plants in preparation for special work in various departments and as an aid in teaching. Instruction will be given in herbarium methods. Laboratory fee, \$4.00; deposit, \$3.00.

S 4. COMPARATIVE MORPHOLOGY OF FUNGI. Credit four hours. Equivalent to Mycology 6. Prerequisite, Course 1 or its equivalent and permission to register.

Lectures, M T W Th F, 9. *Bailey, West Basement.* Laboratory, fifteen actual hours a week, by arrangement. *Bailey, East Basement.* Professor FITZPATRICK. An elementary synoptical course designed to acquaint the student with the general field of mycology. Emphasis is placed on morphology and phylogeny, rather than on taxonomy, but abundant opportunity is given for field work. Laboratory fee, \$6.00; deposit, \$3.00.

S 10. GENERAL PLANT PATHOLOGY. Credit four hours. Equivalent to Plant Pathology 1. Prerequisite, Course 1 or its equivalent and permission to register. Lectures, W M F, 7 a. m. Laboratory work; the completion of a minimum of twenty exercises requiring not less than twenty actual hours a week, with personal conference of half an hour on each. Conferences by arrangement. Laboratory at the student's convenience. Professor MASSEY.

A fundamental course treating of the nature, cause, and control of plant diseases illustrated by studies of the commoner diseases of cultivated crops. Admission limited to twenty students. Laboratory fee, \$4.50; deposit, \$3.00.

S 19. SPECIAL PROBLEMS WITH PLANTS. Credit two or more hours. Hours to be arranged.

Students who are sufficiently prepared may arrange to engage in the study of some problem or special topic. Such work may lie in the fields of general or taxonomic botany, mycology, cytology, plant physiology, or plant pathology. A certain member of the staff must supervise the work.

COURSES DEALING PRIMARILY WITH ANIMALS

S 20. GENERAL ZOOLOGY. Credit six hours. Equivalent to Zoology 1. Lectures, M T W Th F, 9. Laboratory, M T W Th F, 2-5. Field studies at hours to be arranged. *McGraw.* Professor REED and Assistant Professor YOUNG.

A comprehensive view of the subject, including the fundamentals of animal biology; the principles of structure, function, origin, and perfection of animal life; and a consideration of generalizations in zoological theory which seem to be the best founded. The study of animals in their relation as living things will be emphasized. Animal types and their classification are employed only as a service base from which study may proceed. Laboratory fee, \$5.00.

S 21. SYSTEMATIC VERTEBRATE ZOOLOGY AND ECOLOGY. Credit four hours. Lectures, Th F, 9 and 12. *McGraw* 7. Laboratory and field work, Th F, 9-12, 2-5, W, 9-1. Some all-day trips are required. Occasionally a field trip 5:30-8 a. m. or 5-8 p. m. may be substituted for the regular periods. Assistant Professor WRIGHT.

Lectures on fishes, amphibians, reptiles, birds, and mammals: their habits, life-histories, coloration, respiration, locomotion, reproduction, and adaptations; together with their classification, nomenclature, characters, and relationships. Laboratory study of the parts employed in the classification of these groups, with training in the identification of two hundred and forty North American species. Field work is partially to give practice in field observations and in ready identification of local vertebrates in their natural environment, and partially to introduce some ecological methods. Textbooks, *Pratt's Manual of Vertebrates of United States.* Laboratory fee, \$3.00.

S 27. EMBRYOLOGY OF VERTEBRATES. Mornings; hours to be arranged. *Histology Laboratory, Stimson Hall.* Professor KINGSBURY and Mr. ADELMANN.

Laboratory work with individual conferences and demonstrations is offered. The work will consist mainly in a study of the development of the chick and pig. Upon application provision will be made also for advanced students and teachers desiring to do special individual work in embryology or in embryological technique. A laboratory fee will cover necessary expenses.

S 28. HUMAN PHYSIOLOGY. *The functions of the human body.* Credit four hours. A knowledge of general biology is desirable. Lectures, daily except Sat., 10. Experimental work, M T Th F, 2-5. *Stimson.* Professor SIMPSON.

The functions of the animal body will be studied systematically in the lectures and illustrated by diagrams and demonstrations, while in the laboratory the stu-

dent will be required to carry out selected experiments on which the fundamental principles of the science are based. The laboratories in Stimson Hall are equipped with the most recent recording physiological apparatus, all of which the student will have the opportunity of using under direction. Laboratory fee, \$6.

S 30. GENERAL ENTOMOLOGY. Credit three hours. Equivalent to Entomology 3. Prerequisite Biology 1 or Zoology 1 or its equivalent. Lectures, M T W Th F, 10. Practical exercises, T Th, 2-5; S, 8-11. *Roberts* 392. Professor MATHESON.

This course includes lectures and demonstrations on the characteristics of the orders and families of insects, with a study of their habits, life-histories, and relations to other animals and to plants. The laboratory work consists of the study of the structure, ecology, metamorphosis, and classification of insects. Field trips to study insects in their natural habitats are an important feature. Each student is required to collect and prepare a typical collection of insects. Opportunities are given for the rearing of insects in our Insectary, and special work is offered to suit the needs of individual students. Textbook: Comstock's *Manual for the Study of Insects*. Equipment: a good hand lens, several insect cases, insect pins, and labels. These can all be purchased at Ithaca. Laboratory fee, \$2.50.

S 31. ELEMENTARY MORPHOLOGY OF INSECTS. Credit three hours. Equivalent to Entomology 4. Twenty-two actual hours a week, by appointment. *Roberts* 391. Professor JOHANNSEN.

This course deals with the external and internal anatomy of several representative insects as the locust, roach, cicada, honeybee, crane fly, etc. Laboratory fee, \$2.00.

S 32. ELEMENTARY SYSTEMATIC ENTOMOLOGY. Credit two hours. Equivalent to Entomology 5. Prerequisite Course 4. (S 31). Fifteen actual hours a week, by appointment. *Roberts* 391. Professor BRADLEY.

The principles of wing venation and the classification of the orders and families. Laboratory fee, \$2.00.

Courses S 31 and S 32 are required of all students who plan to take advanced work in Entomology.

S 33a. FIELD ENTOMOLOGY. Credit one hour. Field work. Prerequisite, Course S 30, or S 31 and S 32, or equivalent. M W, 2-6. *Roberts* 301. Professor BRADLEY.

The methods of collecting and preserving insects and a systematic exploration of various types of environment, with a view to making as exhaustive a survey as time permits of selected representative insect groups, the ethology of selected insects, and their breeding under control. Laboratory fee, \$3.00. Other expenses are the cost of transportation in connection with the excursions and the cost of equipment and supplies.

This course is designed to be taken in connection with S 33b.

S 33b. ADVANCED SYSTEMATIC ENTOMOLOGY AND ENTOMOTAXY. Credit two hours. Open only to students who are taking Course S 33a. M W F, 8-12; S, 8-1. *Roberts* 301. Professor BRADLEY.

Taxonomy of selected groups of insects, using as laboratory material the specimens collected in course S 33a; matters of museum technique. Laboratory fee, \$3.00.

S 34. ADVANCED MORPHOLOGY OF INSECTS. Credit two hours. Equivalent to the first term of Entomology 20. Prerequisite Course S 31, and either S 30 or S 32. Lectures, assigned reading, and reports. Daily except Sat., 9. *Roberts* 392. Professor JOHANNSEN.

This course deals with the anatomy, physiology, and microscopic structure of insects.

S 35. GENERAL LIMNOLOGY. Credit three hours. Open to students who have taken courses in general biology or in botany and zoology. Lectures, M T W,

8. *Roberts* 392. Laboratory, M T W, 2-4:30, and one period by appointment. *Roberts* 302. Professor NEEDHAM.

An introduction to the study of the life of inland waters. Aquatic organisms in their qualitative, quantitative, seasonal, and ecological relations. The course includes one week-end trip to Lake Ontario. Laboratory fee, \$3.00.

[ANIMAL ECOLOGY. It is proposed that General Limnology and Animal Ecology shall be given in alternate years. The latter course will be given in 1925.]

S 39. SPECIAL PROBLEMS WITH ANIMALS. Credit two hours or more. Hours to be arranged.

Students who are sufficiently prepared may arrange to engage in the special study of some problem or special topic. Such work may lie in the fields of general zoology, ornithology, histology, embryology, human physiology, general entomology, systematic entomology, economic entomology, limnology, or general biology. A certain member of the staff must supervise the work.

GENERAL COURSES DEALING WITH BOTH PLANTS AND ANIMALS

S 40. GENETICS. Credit four hours. Prerequisite, elementary botany and plant physiology, or elementary zoology and animal physiology, and permission to register. Courses in cytology and in taxonomic botany and zoology will be found helpful. Lectures, M T W Th F, 8. Laboratory, M W F, 2-4:30. Conferences to be arranged. *Fernow*. Assistant Professor FRASER.

A general introductory course designed to acquaint the student with the fundamental principles of heredity and variation. Special attention is given to the Mendelian interpretations of the facts of inheritance. Among the topics to be discussed are: the physical basis of heredity; simple cases of Mendelian inheritance; factor interaction; the determination of sex; factor linkage; measurement of variation; quantitative inheritance; pure lines; inbreeding and cross-breeding; cytoplasmic inheritance; and mutation, with suggestions as to the relation of genetical principles to eugenics. Laboratory studies of variation and of the laws of heredity as illustrated by hybrid material in plants and by breeding experiments with the fruit fly, *Drosophila*. Laboratory fee, \$3.

S 41. CYTOLOGY. Credit four hours. Prerequisite course S 1 (Botany 1) or S 20 (Zoology 1) and permission to register. Laboratory, M T W Th F, 9-12:30. A conference hour will be arranged during these periods. *Stone*. Professor SHARP.

This course deals with the subject matter, literature, and problems of cytology. The survey of the field is sufficiently inclusive to make the course of value to advanced students in the various branches of biology, while emphasis on certain features gives it special significance for the geneticist. The conference hours are devoted to discussions of topics suggested by the laboratory observations, and during the latter part of the term, to the review of new literature. Laboratory fee, \$5.

[HISTOLOGY OF PLANTS. It is proposed that the course in Cytology and that in Plant Histology shall be given in alternate years. Plant Histology will therefore be given in 1925.]

S 42. GENERAL BACTERIOLOGY. Credit four hours. Prerequisite some work in microscopy. Lectures, T W Th F, 9. Laboratory, T W Th F, 10-1. *Veterinary College*. Professor HAGAN.

A general introductory course in bacteriology covering the distribution, morphology, biology, and methods of study of micro-organisms. The latter half of this course is concerned with the bacteriology of water, sewage, milk and milk products, the fermentation industries, and of some of the more important human and animal diseases. The laboratory work is closely correlated with the subject matter of the lectures. After a number of sessions devoted to the development of technique, there follows work on the bacteria of air, water, milk, fermentation processes and of disease. Laboratory fee, \$10.

METHODS

Arrangements can be made, contingent upon the time of the instructor, for additional instruction in biological technique. This may include instruction in methods of collecting and preparing laboratory and museum material, the technique of hybridization, etc.

RESEARCH

In addition to the various professors named as directly connected with the Summer School of Biology, other professors who may be in residence during the summer will supervise graduate students engaged in research: Professors BLODGETT, BURKHOLDER, and THOMAS in Plant Pathology; Professors HERRICK and CLAASSEN in Entomology; Professor ALLEN in Ornithology; and Professors LOVE and MYERS in Plant Breeding and Genetics.

OTHER COURSES

Besides the courses here included in the Summer School of Biology, several other courses dealing with plants and animals are given in the Cornell University Summer Session and may be found described in the Announcement of the Summer Session, a copy of which will be sent on request. These are:

GENERAL BIOLOGY. Credit three hours. Assistant Professor CLAASSEN.

ORNITHOLOGY. Credit three hours. Assistant Professor ALLEN.

APPLIED ORNITHOLOGY. Credit two hours. Assistant Professor ALLEN.

TREES AND SHRUBS. Credit two hours. Assistant Professor MUENSCHER.

GARDEN FLOWERS. Credit one hour. Miss MINNS.

GARDEN FLOWERS. Credit two hours. Miss MINNS.

INDOOR FLOWER GROWING. Credit one hour. Miss MINNS.

WOODY PLANT MATERIALS FOR LANDSCAPE PLANTING. Credit three hours. Professor CURTIS and Assistant Professor PORTER.

WOODY PLANT MATERIALS FOR LANDSCAPE PLANTING. Credit two or three hours. Assistant Professor PORTER.

WOODY PLANT PROPAGATION AND NURSERY WORK. Credit one hour. Mr. HUNN.

THE TREE AND THE FOREST. Credit one hour. Professor HOSMER.

FORESTS AND FORESTRY. Credit two hours. Professor HOSMER.

GENERAL NATURE-STUDY. Credit two hours. Professor COMSTOCK and Mr. BEAMAN.

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Announcement of the College of Engineering.

Announcement of the College of Law.

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Announcement of the New York State College of Agriculture.

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Announcement of the New York State Veterinary College.

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Announcement of the Summer Session.

Announcement of the Summer Session of the College of Law.

Announcement of the Summer School of Biology.

Program of the Annual Farmers' Week.

Annual Report of the President.

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Other periodicals are these:

The *Register*, published annually in September, and containing, not announcements of courses, but a comprehensive record of the University's organization and work during the preceding year. Price, 50 cents.

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